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Interpreting P and K soil test results

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Recommended Citation

Sawyer, John E. and Mallarino, Antonio P., "Interpreting P and K soil test results" (1999). *Integrated Crop Management News*. 2229.
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Interpreting P and K soil test results

Abstract

Soil testing is a key component for determining the need for phosphorus (P) and potassium (K) fertilization. Also, if fertilization is required, test results guide the rate of application recommended to optimize production. Through extensive field research, specific soil tests are calibrated against the expectation of response to applied P and K; that is, they provide both a relative index of the availability of P and K to the crop being grown and an indication of the magnitude of yield increase one might expect when nutrients are applied, thus providing the interpretation of test results.

Keywords

Agronomy

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences | Soil Science



Soil
Fertility

Interpreting P and K soil test results (1/18/1999)



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164-166

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the [Department of
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Ames, Iowa.

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Soil testing is a key component for determining the need for phosphorus (P) and potassium (K) fertilization. Also, if fertilization is required, test results guide the rate of application recommended to optimize production. Through extensive field research, specific soil tests are calibrated against the expectation of response to applied P and K; that is, they provide both a relative index of the availability of P and K to the crop being grown and an indication of the magnitude of yield increase one might expect when nutrients are applied; thus providing the interpretation of test results.

In Iowa, P and K soil tests are reported in parts per million (ppm), with interpretative ranges from very low (very deficient level of available P or K in the soil), low, optimum, high, on to very high (much more than adequate level of available P or K in the soil). According to ISU field research, the optimum category is the most profitable to maintain over time due to several factors, including uncertainty in soil tests, greater penalty for under-fertilization, and the possibility of skipping fertilization one year (like this year with low crop prices). Crop removal P and K applications are suggested at optimum test levels. Example soil-test P (Bray P₁ and Olsen P) and soil-test K (Ammonium Acetate K) interpretations for corn, along with suggested broadcast P₂O₅ and K₂O application rates, are shown in Table 1. Note that the rate of fertilization decreases as soil tests increase, and eventually the suggestion is to not apply any P or K.

Is it really alright to not apply P or K when soils test high or very high, as these recommendations suggest? In general the answer is yes. Long-term research results, like those shown in [Figure 1](#), below, indicate that the economic return to P or K application is low at high or very high test levels. Some specific soil or climatic conditions may result in small yield increase from nutrient application at these test levels (e.g., starter may be recommended for corn at high test levels), but for most situations the probability and magnitude of response is low.

In the short term, P and K can be withheld on soils testing slightly above optimum; however, realize that with crop harvest and resultant removal of nutrients soil tests will decline and increased fertilization will eventually be required. Soils testing very high have little probability of yield increase from nutrient application, and could have P and K withheld for several years before fertilization would be required. Soils should be tested regularly to monitor changes in test levels when fertilization is withheld.

For more information on soil testing, especially for interpretations and recommendations for P and K, please refer to ISU [Extension Publication Pm-1688](#). This publication is available from county extension offices or from the Extension Distribution Center (515-294-5247).

Recommendations in Pm-1688 may be viewed at
<http://extension.agron.iastate.edu/fert/>.

Table 1. Phosphorus and potassium recommendation for corn grain production.

Phosphorus (P) soil test (ppm)					
Soil test category	Very low	Low	Optimum	High	Very high
Bray P ₁ :					
Low subsoil P	0-8	9-15	16-20	21-30	31+
High subsoil P	0-5	6-10	11-15	16-20	21+
Olsen P:					
Low subsoil P	0-5	6-10	11-14	15-20	21+
High subsoil P	0-3	4-7	8-11	12-15	16+
P₂O₅ to apply (lb/acre)					
	100	75	50	0	0
Optimum: removal at 140 bu/acre.					
Potassium (K) soil test (ppm)					
Soil test category	Very low	Low	Optimum	High	Very high
Ammonium acetate extractable K:					
Low subsoil K	0-60	61-90	91-130	131-170	171+
High subsoil K	0-40	41-80	81-120	121-160	161+
Fine textured	120	90	40	0	0
Sandy textured	100	70	40	0	0
Optimum: removal at 140 bu/acre.					

All data from Pm-1688, [General Guide for Crop Nutrient Recommendations in Iowa](#).

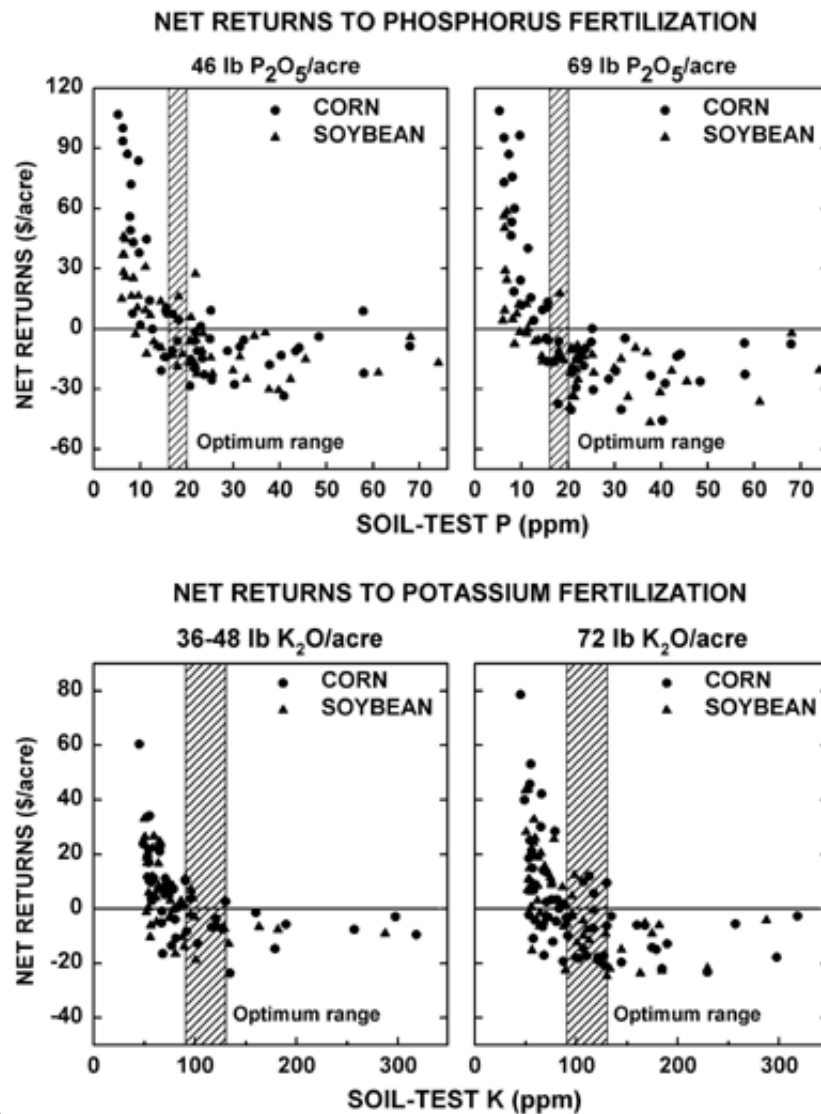


Figure 1.

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